



## Case report

## Difficulties in personal identification caused by unreliable dental records



Dorota Lorkiewicz-Muszyńska, PhD, MSC, Assistant Professor <sup>a, \*</sup>,  
 Agnieszka Przysańska, PhD, DDS, Assistant Professor <sup>b</sup>,  
 Mariusz Glapiński, PhD, DDS, Assistant Professor <sup>c</sup>,  
 Wojciech Kociemba, PhD, D.M.D., Assistant Professor <sup>d</sup>,  
 Czesław Żaba, PhD, D.M.D. Head of the Department <sup>a</sup>

<sup>a</sup> Department of Forensic Medicine, Poznań University of Medical Sciences, ul. Święcickiego 6, 60-781 Poznań, Poland

<sup>b</sup> Department of Anatomy, Poznań University of Medical Sciences, Poland

<sup>c</sup> Oral Rehabilitation Clinic, Poznań University of Medical Sciences, Poland

<sup>d</sup> Department of Neuroradiology, Poznań University of Medical Sciences, Poland

## ARTICLE INFO

## Article history:

Received 22 February 2013

Received in revised form

5 September 2013

Accepted 7 September 2013

Available online 18 September 2013

## Keywords:

Forensic odontology

Superimposition

Dental records

## ABSTRACT

This paper demonstrates a case of personal identification that initially seemed straightforward, mainly because complete and comprehensive antemortem dental records of a missing person were made available for analysis. Skeletal remains were found and the skull (most crucial for human identification) was delivered for analysis. Comparative analysis of antemortem and postmortem dental records excluded identification, while the results of superimposition (simultaneously performed by another team member) revealed sufficient concordant points to establish identity. The results caused confusion and additional information was required. The need for more evidence resulted in delivery of elements of the postcranial skeleton. Identification was finally achieved when concordant points were established in a comparison of antemortem X-rays and the humerus. Team members concluded that the dental records were in fact not adequate and that mistakes in numbering the teeth (superior canine instead inferior canine and right and left premolars) were considered to be the initial reason a positive identification had not been made. The authors conclude that a multidisciplinary approach is crucial to making a positive identification and that caution should be exercised when carrying out personal identification from dental records alone. The need to adequately train police officers to collect and preserve dental evidence is also emphasized.

© 2013 Elsevier Ltd and Faculty of Forensic and Legal Medicine. All rights reserved.

## 1. Introduction

The personal identification of skeletonized human remains is the responsibility of many experts (medical doctors, odontologists, anthropologists, radiologists and geneticists). Their comprehensive and often long-lasting investigations can be particularly challenging when all the relatives of the deceased are dead and there is no comparable material for genetical analysis. Moreover, in some countries unclear protocols relating to personal identification do not facilitate the proceedings. Although it is difficult to determine how many concordant points are required to establish identity, the

role of the multidisciplinary team is to find as many of them as possible.

Forensic odontologists are most often involved in the identification of skeletonized remains as odontological methods are particularly effective if dental records are available. The presented case is an example of how important the collaboration of experts representing different forensic specialisms is, even in single cases, and how, when used simultaneously the different methods can prevent erroneous conclusion. Unreliable dental records could dramatically contribute to a wrong expert opinion.

## 2. A case history

The skull and elements of postcranial skeleton were discovered in a suitcase in the basement of a house in the town of L.

\* Corresponding author. Tel.: +48 61 8546415.

E-mail address: [dlorkiew@ump.edu.pl](mailto:dlorkiew@ump.edu.pl) (D. Lorkiewicz-Muszyńska).

Following the initial investigation, the public prosecutor sanctioned a comparative identification procedure with a missing man (M.J.). An interdisciplinary team of experts (forensic anthropologist, forensic odontologist, radiologist) was involved in a case. The aim of the research was to investigate whether the human skull and the parts of the postcranial skeleton discovered in L. in 2012 could be identified as remains of M.J., who had been missing since 2003.

The evidence taken into consideration included: the human skull with mandible, right and left humerus, two antemortem photographs of M.J., and dental records.

### 3. Comparative analysis

Because the dental records seemed to be complete and reliable, and very well preserved upper and lower jaws with the teeth had been delivered, the odontological investigation was the first to be performed.

#### 3.1. Odontological investigation

An analysis of the teeth in the maxilla and mandible found that some of the teeth had been glued into place, they had however been glued the wrong way into the wrong place. After dissolving the glue it was possible to remove and replace all but two of the teeth into the appropriate sockets (LL1 and LL2 were firmly stuck).

The results of the postmortem odontological investigation are shown in Table 1.

The dental records of the missing man were investigated and the results are shown in Table 2.

It was concluded that the bones and teeth did not correspond to the dental records.

**Table 1**  
Postmortem odontological investigation.

|     |  |  |     |
|-----|--|--|-----|
| UR1 | <b>sou</b>   | <b>mpm</b>   | UL1 |
| UR2 | <b>sou</b>   | <b>sou</b>   | UL2 |
| UR3 | <b>sou</b>   | <b>sou</b>   | UL3 |
| UR4 | <b>sou</b>   | <b>mpm</b>   | UL4 |
| UR5 | <b>mam</b> (the alveolar socket completely healed, UR6 tilted towards the empty place, the tooth was lost several months before death) | <b>caries profunda, OB</b> (could be treated, no filling)  | UL5 |
| UR6 | <b>caries profunda, MO</b>   | <b>mam</b> (the alveolar socket completely healed, UL7 tilted towards the empty place, the tooth was lost several months before death) | UL6 |
| UR7 | <b>sou</b>   | <b>caries superficialis, O</b>   | UL7 |
| UR8 | <b>caries superficialis, O</b>   | <b>caries superficialis, O</b>   | UL8 |
| LR8 | <b>caries superficialis, O</b>   | <b>caries superficialis, O</b>   | LL8 |
| LR7 | <b>caries media, O</b> (could be treated, no filling)  | <b>caries superficialis, O</b>   | LL7 |
| LR6 | <b>sou</b>   | <b>amf, O</b>  | LL6 |
| LR5 | <b>sou</b>   | <b>mam</b> (the alveolar socket completely healed, LL6 tilted towards the empty place, the tooth was lost several months before death) | LL5 |
| LR4 | <b>sou</b>   | <b>sou</b>   | LL4 |
| LR3 | <b>sou</b>   | <b>mam</b> (the alveolar socket completely healed, LL4 tilted towards the empty place, the tooth was lost several months before death) | LL3 |
| LR2 | <b>mpm</b>   | <b>sou</b>   | LL2 |
| LR1 | <b>sou</b>   | <b>sou</b>   | LL1 |

#### 3.2. Anthropological investigation

The anthropological study of the skull and postcranial elements were conducted simultaneously by another team member.

The skull was examined first, followed by the anthropometric survey. All the features showing sexual dimorphism (i.e. sites of muscular attachments, mandible, mental region) were visually inspected. The sex determination based on metrical features was performed and it was finally concluded that the skull was male.

The comparison of a physical description of M.J., obtained from the antemortem photographs allowed the following conclusions to be made:

- 1) The sex (male) of the investigated skull was concordant with that of the missing person.
- 2) The age estimated by anthropological means (35–46 years) correlated with age of M.J. at the day of disappearance (36 years).
- 3) The external facial characteristics (shape of the face, width–height parameters, character and proportions of the morphological elements) of the investigated skull and the physical description of M.J. showed complete concordance.

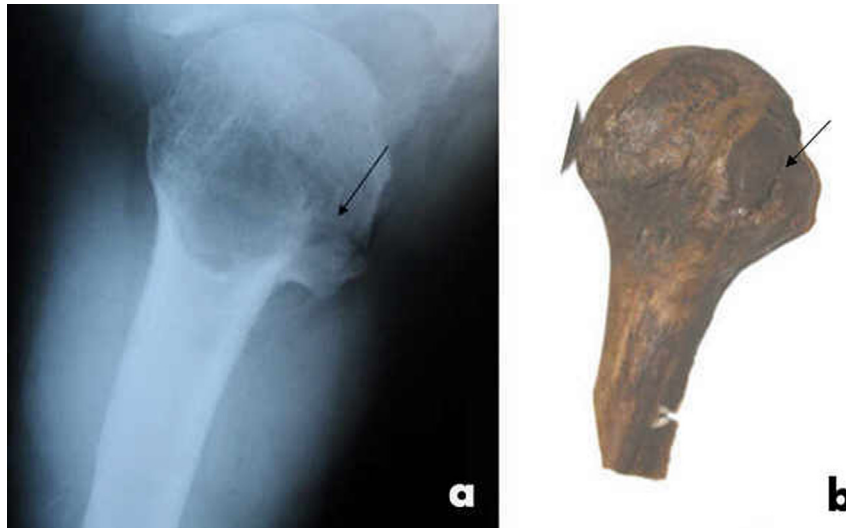
Afterwards, two photographs of M.J. were used for the superimposition test. A Canon D20 digital camera with tripod and lightning accessories was used to take photographs. Computer-aided superimposition was made using Adobe *PhotoShop4* software.

The superimposition of the images of the skull and head of M.J. was provided by controlling the correlation of images, the size of the skull comparable to the size of the head and the soft tissue thickness.

A detailed analysis of a photomontage of the two images (the skull and the image of the head taken from the real antemortem photograph) showed that the contour of the skull completely corresponded to the contour of the head. The reciprocal arrangement of the skull and head morphological elements as well as the viscerocranium and facial morphological elements revealed full concordance. The analysis showed complete correlation between the width–height parameters of the skull and the head of the photographed person in all investigated pairs of elements. Following the investigation of the skull the elements of postcranial skeleton, right and left humerus, were observed. The structure revealed that the bones belong to an adult, and the left humerus showed the trace of a fracture within the base of the greater tubercle (Fig. 1).

**Table 2**  
Antemortem odontological record. The unexplainable discrepancies marked with “!”,

|     |   |                         |     |
|-----|---|-------------------------|-----|
| UR1 | <b>sou</b>                                      | <b>sou</b>              | UL1 |
| UR2 | <b>sou</b>                                      | <b>sou</b>              | UL2 |
| UR3 | <b>sou</b>                                      | <b>endo !</b>           | UL3 |
| UR4 | <b>sou</b>                                      | <b>sou</b>              | UL4 |
| UR5 | <b>sou</b>                                      | <b>caries</b>           | UL5 |
| UR6 | <b>caries profunda</b> (extraction recommended) | <b>mam (28.03.1988)</b> | UL6 |
| UR7 | <b>sou</b>                                      | <b>sou</b>              | UL7 |
| UR8 | <b>sou</b>                                      | <b>sou</b>              | UL8 |
| LR8 | <b>sou</b>                                      | <b>sou</b>              | LL8 |
| LR7 | <b>mam (unerrupted)</b>                         | <b>sou</b>              | LL7 |
| LR6 | <b>amf</b> .....!                               | <b>sou</b>              | LL6 |
| LR5 | <b>sou</b>                                      | <b>caries profunda</b>  | LL5 |
| LR4 | <b>sou</b>                                      | <b>sou</b>              | LL4 |
| LR3 | <b>sou</b>                                      | <b>sou</b>              | LL3 |
| LR2 | <b>sou</b>                                      | <b>sou</b>              | LL2 |
| LR1 | <b>sou</b>                                      | <b>sou</b>              | LL1 |



**Fig. 1.** The antemortem rtg showing the fracture and the humerus of the remains showed concordance.

Due to contradictory conclusions the police were asked to look for more antemortem records (especially X-rays) of the missing person. Their enquiries at the local hospital proved successful and two X rays were found. A mandible-oblique roentgenogram taken after a sporting competition (the missing man was a boxer and a fracture of the mandible was suspected) as well as the AP roentgenogram of both the right and left shoulder joints completed the case file.

The comparative analysis of the mandible-oblique roentgenogram and investigated skull revealed the concordance of the number and kind of both the posterior left superior and inferior teeth, as well the occlusion and the position of the teeth within the arch and between the arches. The concordant points were also found in the shape, contours and proportions of the mandible and its characteristic structures (Fig. 2).

The analysis of medical records of a missing person (the X-ray) revealed the infraction of the greater tubercle of left humerus in the year 2000.

### 3.3. Explanation of the discrepancies

The dental status of the investigated skull differs from that found in the dental records. This could be the result of a few years having passed between date of the last records and the date the man went missing.

Dental records reveal the trepanation of the pulp cavity. Tooth UL3 found in the skull shows no signs of any procedures. Taking into consideration that the extraction of canines occurs very seldom, and that tooth LL3 is missing antemortem, it can be

concluded, that this tooth has been lost as a consequence of endodontic treatment and/or complication and it has been wrongly indicated as UL3 (the superior and inferior teeth were mistaken) in the chart.

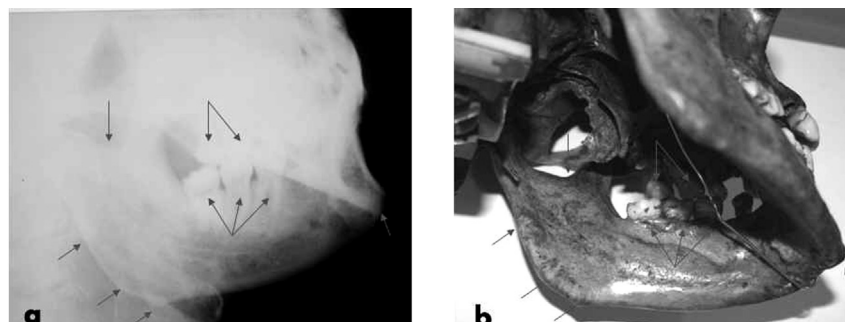
The dental records reveal the treatment (filling) of tooth LR6. The corresponding tooth (LR6) of investigated skull was sound. The little amalgam filling on the occlusal surface (class I, caries superficialis or media) was found in tooth LL6. Taking into consideration the dental status and pathological changes it can be concluded that the filling was applied many years ago and thus it should be pointed in the dental records. It was probable another mistake and tooth LL6 was marked LR6 in the record (left side had been mistaken with the right).

The positive conclusions were admissible in this case because they were based on anthropological investigation and analysis of radiological records.

### 4. Discussion and conclusion

The most difficult cases of personal identification should be conducted using as many known and applicable methods as possible and by specialists representing different forensic fields. Anthropological and odontological investigations deal with both the skull bones and the teeth, thus odontological analysis along with the anthropological evaluation gives satisfactory results in the identification of skeletal remains.<sup>1,2</sup>

The odontological investigation requires the comparison of antemortem and postmortem records, therefore further investigation can only be possible with access to both. Moreover, the



**Fig. 2.** The comparison of the antemortem mandible-oblique rtg and the mandible of the remains.

assumption *a priori* is that the dental records are reliable and reflect the actual (related to the point in time) condition of the dentition. Obviously, the forensic odontological analysis cannot be effective if the dental records are not properly maintained or recorded in sufficient detail.<sup>3</sup> On the other hand, the results of the investigation depend not only on the quality of the records, but also, or most importantly, on the knowledge and experience of the forensic odontologist.<sup>4–7</sup> The decision and responsibility lies with the expert only.

The odontological analysis is based on findings including similarities and differences. There are two types of discrepancies: explainable and unexplainable.<sup>8</sup> It is suggested that if the discrepancies cannot be explained (eg. the tooth missing antemortem and present in postmortem record), the exclusion should be made.<sup>8</sup> The history of above presented case shows that even when the discrepancies are unexplainable, circumspection is recommended to avoid exclusion.

Due to mistakes in the dental records the wrong conclusion may have been reached had an independent investigation by another expert not been performed. Experts, in principle, should limit their confidence in dental records. Our observations confirmed the statement of Davidson<sup>9</sup> that there is a need for additional information in equivocal situations.

This case history highlights not only the importance of carefully collecting dental records but also the importance of ensuring that all police officers are adequately trained in the procedures to be followed for their collection as previously reported.<sup>10</sup>

In the presented case, the incompetent interference in the placement of the teeth, probably carried out by the police to better preserve the dental evidence (single, movable teeth), could be misleading and cause erroneous opinion. Fortunately it was partially invertible, but returning them to their original state involved extra time and specialist chemists.

Lessons learned in this case include advising against making hasty conclusions and the recommendation that during identification procedures interdisciplinary cooperation is essential.

#### *Ethical approval*

None declared.

#### *Funding*

None declared.

#### *Conflict of interest*

All authors declared no conflict of interest.

#### **Acknowledgement**

The authors would like to thank Mrs. Ruth Hounam for her gratuitous language help.

#### **References**

1. Avon SL. Forensic odontology: the roles and responsibilities of the dentist. *J Can Dent Assoc* 2004;**70**:453–8.
2. Tinoco RLR, Martins EC, Daruge E, Daruge E, prado FB, Caria PHF. Dental anomalies and their value in human identification: a case report. *J Forensic Odontostomatol* 2010;**28**:39–43.
3. Petju M, Suteerayongprasert A, Thongpud R, Hassiri K. Importance of dental records for victim identification following the Indian Ocean tsunami disaster in Thailand. *Public Health* 2007;**121**:251–7.
4. Borrmann H, Gröndahl HG. Accuracy in establishing identity by means of intraoral radiographs. *J Forensic Odontostomatol* 1990;**8**:31–6.
5. Ekstrom G, Johnsson T, Borrmann H. Accuracy among dentists experienced in forensic odontology in establishing identity. *J Forensic Odontostomatol* 1993;**11**:45–52.
6. Jain AK, Chen H. Matching of dental X ray images for human identification. *Pattern Recognit* 2004;**37**:1519–32.
7. Sand LP, Rasmusson LG, Borrmann H. Accuracy of dental registrations in forensic odontology among dentists and dental students. *J Forensic Odontostomatol* 1994;**12**:12–4.
8. Pretty IA, Sweet D. A look at forensic dentistry—Part 1: the role of teeth in the determination of human identity. *Br Dent J* 2001;**190**:359–66.
9. Dawidson I. Case reports and background: difficulties with identification—Sweden. *J Forensic Odontostomatol* 2011;**29**:1–6.
10. Brown KA. Procedures for the collection of dental records for person identification. *J Forensic Odontostomatol* 2007;**25**:63–4.